Background of the Invention

The apparatus of the invention is a device for spiral slicing a potato for frying as a potato chip. Review of prior art shows similarity of component parts of these prior inventions. Each included parts designed to engage, position, support, rotate and advance the potato into a blade for the slicing to occur. A crank or motor attached to a threaded shaft provides the rotation and forward thrust which advances the potato to the blade. The threads on these shafts were found to be thread types Acme, Square and Buttress. These thread types are technically referred to as translation threads in this and similar applications. Acme, Square and Buttress thread types are effective due to the near straight thread profile. When a shaft and a mating fixed drive nut, threaded with these thread types are engaged, it can most easily be held in engagement. A problem with these thread types is they are very expensive to manufacture and have limits to the number of threads per inch possible. A single point tool or high cost geometric die head is required to produce these threads.

The apparatus of the invention utilizes a threaded shaft and mating half-nut with 3/8" - 16 threads per inch screw threads. These screw threads are widely employed in static applications as fasteners as

with bolts and nuts. The 60 degree thread angle of 3/8" - 16 threads per inch screw threads produce much higher pressures toward disengagement than a square thread or the near square 29 degree acme thread. Manufacturing techniques and processes were employed to adapt the 3/8" - 16 threads per inch screw threads for use as translation threads. Maintaining the engagement of the 3/8" - 16 threads per inch threaded shaft with an internally threaded half-nut during slicing required engineering, parts modification and special processing to accomplish. Modification of the component parts are explained in the Detailed description of the invention.

Detailed description of the Invention

The apparatus of the invention relates to the slicing of a potato for frying as a potato chip using 3/8" - 16 threads per inch screw threads. The use of this screw thread produces a potato slice of approximately .0625 inch thickness. In operation of the apparatus manual pressure is applied to an internally threaded half-nut which then engages the externally threaded shaft. Prior art referenced included devices to slice potatoes for frying both as potato chips and as french fries. Each prior art device reviewed employed a threaded shaft and a mating threaded component which when the shaft was rotated by a crank or motor provided rotation and forward thrust to advance the potato to a blade for the slice to occur. The threaded shafts and mating components on all the prior art were found to use translation* thread forms of Acme, Square or Buttress. The apparatus of the invention differs in that the thread form used is 3/8" - 16 threads per inch screw threads to provide the rotation and forward thrust to the potato as it is sliced. Cutting of a thinner chip, lower material cost and lower manufacturing cost were the motivation to pursue use of this thread type.

316 Series Stainless steel was selected for the material to be used for the shaft of this food service device. 316 series stainless steel

threaded shaft material with 3/8 - 16 threads per inch is commercially available in 10 foot lengths and is manufactured with rolled threads. The thread rolling process generates a trace amount of displaced material at the crest of the threads. In common use static applications as fasteners such as bolts, studs and nuts this would not impair performance but with the use of this material as a translation thread* it was found to cause wear on the carbon steel guiding tube in which the shaft rotates. Repeated cycling of the device with high pressures being applied to the threaded half-nut resulted in the rotating shaft thread crest wearing into the inside diameter of the guide tube. Two manufacturing methods were selected to resolve this problem; first the threads were ground .010 inch on the shaft outside diameter to slightly flatten the crest and remove the trace material. Secondly the inside of the guiding tube was heat treated by carbonization and hardening. This is accomplished by heating the low carbon steel tube to cherry red on a propane burner. The tube is then filled with carbon particles which stick to the inside diameter of the tube. The tube is again heated to cherry red for the carbon transfer and the tube is then water quenched.

The testing required to utilize the 3/8" -16 threads involved various pressure levels being applied to the threaded half-nut to

maintain engagement with the threaded shaft. 3/8" -16 threads per inch screw threads are vee shaped threads. The thread angle of the 3/8" - 16 threads per inch is 60 degrees and this angle results in a higher pressure toward disengagement between the threaded shaft and threaded half-nut as compared to prior art for example using Acme threads with a thread angle of only 29 degrees or buttress 1-5 degrees on external threads and 7 degrees on internal thread drive surfaces.

Initial use of stainless steel to manufacture the half-nut was found in testing to result in traces of abrasion on the threads. This was attributed to the above noted testing with high pressures. To avoid this abrasion or galling CDA 360 brass material was selected for the half-nut and has been determined to function effectively with no abrasion or galling.

***translation threads - Machinery's Handbook 22nd Revised Edition, page 1206, Screw Thread Systems: "the most widely used translation thread forms are square, acme and buttress" etc.**